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Academic Libraries, Science and Technology Development and the Nigerian Smart City Initiative (NSCI): Issues, roles and Challenges

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Abstract

This paper sought to unravel the contributions of academic libraries in Nigeria towards science and technology development for the building of smart Nigerian cities basedon the Nigerian Smart City Initiative (NSCI). The paper proposed a new model that shows the linkage between academic libraries, science and technology development and smart city development. A review of the state of the art of academic libraries in Nigeria indicated their failings in their expected rolesin stimulating science and technology development for the building of smart Nigerian cities. To revitalize Nigerian academic libraries, the paper advocated for developmental efforts by the government, university and research communities to utilize the IPST (infrastructure-People-Systems-Technology) approach. The study concluded that while academic libraries in Nigeria have the potential for providing tremendous support for the transformation of Nigerian cities into smart cities, however, at the moment, if suggestions in this paper are not adopted and/or adapted, the realization of the goals of the Nigerian Smart City Initiative maybe far-fetched.

Keywords: Academic Libraries, smart cities, science and technology development

Introduction

Nigerian is a complex society and its development has been and still is of great interest to scholars around the world. This interest is usually due to Nigeria's huge potential for socio-economic growth and development. In the 21st century, the race for development across the globe

is faster and more intense as cities are metamorphosing into engines for growth as a result of heavy rural to urban migration. The phenomenon of extreme urbanization is usually seen as a treat to homogenous growth and development across most developing countries like Nigeria, however, recent trends show that cities create wealth, general employment and drive human progress by harnessing and harmonizing the agents of industrialization. This is important to note for a country like Nigeria whose most recent development plans are geared towards urbanization and industrialization. These plans are in order because there is a direct linkage between urbanization and industrialization. Simply put, urbanization provides the socio-economic construct or environment for industrialization to take place. Similarly, science and technology development has been identified as the single most important driver of industrialization as witnessed in already developed nations. Thus, consistent science and technology advancement brings about technological innovations that transform every sphere of a modern society. Technological innovations can help cities and communities meet the current challenge of governance, tackle complex social problems improve urban and rural environments, become more competitive and address sustainability concerns (Mersand, Udoh, Gasco-Hernandez & Gil-Garcia, 2019).

Technological innovations are driven by knowledge-based societies as knowledge is very vital in achieving scientific and technological development anywhere in the world. In this present era, knowledge-based societies are synonymous with smart cities, thus, this shows that there is a clear relationship between smart cities, science and technology development with academic libraries which are repositories of knowledge and active agents in research and development for scientific and technological advancement. Academic libraries initiate knowledge revolution that creates dynamic societies driven by the quest for knowledge specific to sustainability. Its contribution to the development of knowledge-based societies is fundamental as every other active agent for the development of knowledge-based societies relies on the academic library for effectiveness. Furthermore, it is important to note that academic libraries are the foundations of a knowledge-based society, and thus are vital in the development of smart cities viz-a-viz smart societies. This is to say that in Nigeria's quest for economic development through urbanization and industrialization, it is necessary to integrate academic libraries into the development model to be implemented. Hence, this paper explores the issues and challenges affecting the contributions of academic libraries to technological advancement for the building of smart cities in Nigeria.

Conceptual Framework

Academic library

According to Schoptel (2018), libraries are cultural and scientific institutions with holdings, book stacks, reading rooms, physical learning spaces as well as virtual hubs of knowledge consumption and production. They serve as key agents for educational attainment and information literacy. They are cultural assets as they provide a safe environment were technological and productivity meet and enhances communal and human values. Academic library are libraries found in educational and research institutions. These libraries provide specific information and intellectual support services to students, lecturers, researchers and other community of scholars within and outside the physical space in an academic/research institution where they are domiciled in. Joel and Ayinla (2015) was of the view that academic libraries are an integral part of higher institutional learning and as such should be regarded as the “live-wire" of such institutional learning. Academic libraries are repositories of institutional knowledge, which is current, up-to-date and relevant to initiate newer discoveries, innovations, processes, systems and a better way of doing things for the benefit of mankind. With the shift in global developmental trends to a knowledge-based economy, the need for the existence of effective academic libraries cannot be overemphasized. This is why academic libraries are seen as foundations of a knowledge-based economy. Thus academic libraries are taken up new roles synonymous with the knowledge revolution presently experienced globally. However, Joel and Ayinla (2015) noted that the general functions of academic libraries are as follows:

- To provide; information materials required for the academic programmes of the parent institution.
- Research information resources in consonance with the needs of faculty and research students.
- Information resources for recreation and personal self-development of users.

- Study accommodation in a useful variety of locations
- Protection and security for their materials.
- Specialized information service to appropriate segments of the wider community and
- To cooperate with other libraries at appropriate levels for improved information services.

Smart libraries

Smart libraries are libraries that provide user support services to library patrons using systems and technologies driven by the internet usually to reduce access time, cost and constraints with service delivery. According to Nahak and Padhi (2019), Smart libraries are "libraries without a single physical lending item on the shelves, without books in print, library without books in print, library without shelves, just large cooled servers, whirring digital archives linked through digital networks with machines for copying and distribution". Thus, smart libraries provide library services faster and better using digital technology, embedded systems, artificial intelligence and internet of things (IoT). They are the library of the future designed for smart cities and knowledge-based societies. However, a core element of a smart library is the smart librarian thus integrating it into the conceptualization of smart libraries provides a holistic view to it. Thus, smart libraries are libraries that are built around smart people, smart systems, smart technologies providing increased access to library services from anywhere in the world.

Smart cities

A smart city is the city of the future and a reasonable solution to the realities and challenges of urbanization presently been experienced in developing countries. A smart city provides technology-based solutions to every facet of contemporary society. Hence, a smart city integrates smart initiatives in governance, economy, transportation, education etc. The goal of a smart city is to improve the quality of life, create a friendlier environment and improve the prospects for socio-economic development Lee, Hancock & Hu, (2014).

According to Pens, Nunes and Zheng (2017), a smart city is a city using a set of advanced technologies such as wireless sensors, smart meters, intelligent vehicles, smartphones, mobile networks or data storage technologies. While the above conceptualization takes the technology-based approach, only a few researchers have integrated the idea of smart people into the conceptualization of the smart city. Smart people are a constituent of a smart city as they are the

ones who conceptualize smart initiatives, design and integrate them into the city to improve quality of life and ease the performance of various activities in the city. Thus, a smart city is a knowledge-based society filled with intelligent citizens who conceptualize, design and utilize smart initiatives driven by technologies as solutions to the dynamic challenges of a modern city. Figure 1 below is the conceptual framework for a smart city adapted from Winkowska, Szpilko&Pejic (2019).

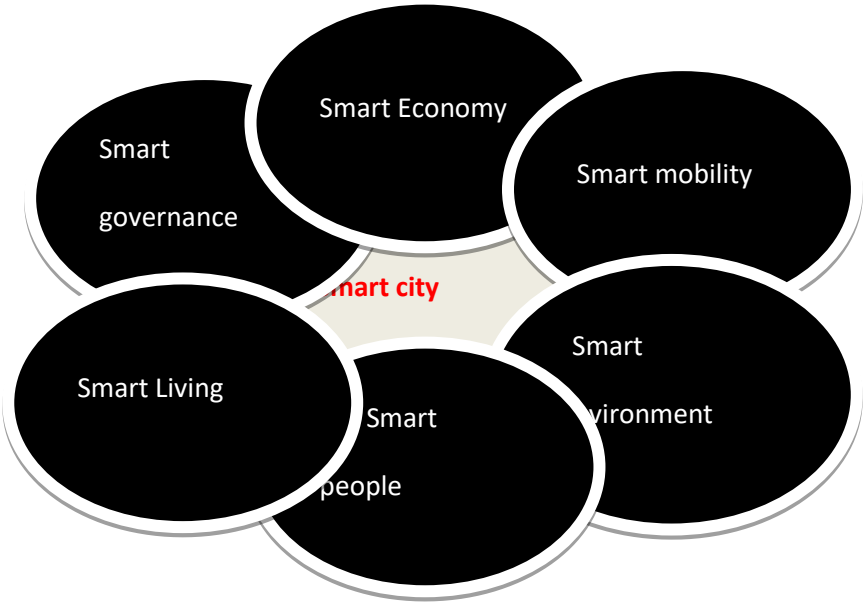

Figure 1: Model of a Smart City

Elements of a Smart City

A smart city is a conglomeration of certain socio-cultural constructs that are integrated for smart living and improved quality of life. The following are the elements of a smart city.

- Smart People
- Smart governance
- Smart economy
- Smart environment
- Smart Place (smart library)
- Smart mobility

Smart people is the key element of a smart city, it gives rise to the other elements of a smart city. “Smart people” is the originator and developer of a smart city. Hence, citizens of smart cities are usually described in terms of flexibility, creativity, tolerance, innovativity empowerment, cosmopolitanism and participation in public life. According to Sstawasz and Sikora-fernandez, (2016), smart people are characterized by the level of innovativeness, life-long learning, social and ethnic diversity, creativity, openness and participation in public life-smart living is synonymous with a very high quality of living. It is evidenced by improved living conditions and increased access to public infrastructures and systems such as health systems, educational systems and city life.

Smart governance deals with the ease for citizens to participate in governance. It requires making governance processes, public information public services and public participation web-based(Zanella, Bui, Castellani, vangelista&Zorzi, 2014) noted that smart governance refers to the transparency of city management, social participation, level of public services and the implementation of development strategies.

Smart economy refers to an economy driven by technological initiatives such as e-banking, e-financial services, e-money, e-trading etc. Thus, ease of doing business is high and this allows a lot of business transactions to be done at almost the speed of light. Smart economy reduces the cost of doing business to a minimum as a result of electronic transactions. The smart economy is measured by entrepreneurship and a city's productivity, adaptation to changes, the flexibility of the labour market and international cooperation (Lombardi, Giordano, Farouh&Vousef, 2012).

The smart environment is synonymous with public and private infrastructure with a green environment, universal accessibility and technological innovations. In the aspect of physical infrastructure, smart environment deals with automated power grids, district heating and cooling systems, water storage and distribution systems integrated to automatically provide public utilities. Based on green environment concept, a smart city ensures all aspects of the city adapt the green initiatives to ensure the sustainability of the environment. Likewise, the issue of universal accessibility provides that all infrastructures are designed to include special access systems for people living with disabilities.Generally, the smart environment is measured by the aesthetic beauty of the city pollution levels, environmental protection activities and resource

management methods. Thus, a smart environment has three key elements uniquely driven by technological innovations.

Closely related to the concept of smart environment is the ‘smart place’. This is attributed to infrastructures that support smart learning, creation of knowledge hubs, research groups etc. Usually from the information science perspective, the smart place is a smart library. The smart library combines innovative qualities from the green library and technological innovations for libraries and describes the transformation of the traditional library building and its functioning as a smart place that contributes significantly to the sustainable development of a city.

Smart mobility entails movement/transportation of people, goods and services and information. Smart mobility covers the efficient movement of people using fast and green transportation systems such as electric cars, advanced fast and efficient train systems, public buses that run on cleaner fuels; it deals with the use of trans-regional cargo train systems that move goods safe and easy. Smart mobility also entails the movement and accessibility to information. This is mainly achieved through digitalizing of information using smart libraries and ICT technologies.

Elements of a Smart Library

Schoptel (2018) noted that the smart library has a double character: it allows the consistent description of some particular development and realizations of public and academic libraries in urban settings and on scientific campuses. It can also contribute to a new and dynamic vision of the libraries of tomorrow. The smart library is made of four elements, the first is ‘infrastructure’, the second is ‘people’, the third is ‘system’ and the fourth is ‘technology’.

Infrastructure is synonymous with the "smart place' concept. The smart library should be a physical building designed for universal physical and electronic accessibility. The smart library is a smart building where its accessories are automated and integrated into digital networks. Thus, it is digitally monitored for the safety of digital networks, people, electrical devices and books. The smart library integrates the green initiative into architectural design, waste management and power supply and management. For example, loose papers from making photocopies are recycled and architectural design allows for penetration of natural light during the day to reduce energy demand etc.

‘People’ is synonymous with the “smart people” concept. Smart people here refer to smart librarians who manage the smart library and provide smart library services. These librarians are saddled with the production and analysis of information and data as well as the control of discovery tools. “People” also refers to researchers, scholars and general library users who are part of the library community. These two categories of smart people are included because they contribute to the creation, enrichment, and sharing of information and knowledge which are the hallmarks of a smart library user.

‘Systems’ refers to institutional processes and framework put in place to ensure smart and effective management of a smart library; in order words smart governance. It also deals with systems designed to facilitate collaboration, cooperation, partnership, citizenship engagement and participation that are integrated into the library to improve access to information and service delivery. Hajek and Stejskal (2014) noted that in the heart of smart governance (systems) is the library community which understands the potential of information technology for the development of the library as a means of reinvesting libraries for a new ecosystem. Jerkov,Sofronijevic and Stanisic (2015) also observed that the keyword of smart governance is collective intelligence based on shared responsibilities between the library staff, the library community and other institutions. Smart library management systems ensure library openness and embeddedness in its social and cultural environment; transparency of the administration and management, automatic and optimized administration procedures, and improved user participation in decision-making.

Technology is the livewire of a smart library. This entails the embedding of ICT technologies into library and library processes. As a result, the smart library provides services that possess interoperability and interconnection with other information services. Similarly, a smart library uses technology to connect with other libraries and urban services in a larger information ecosystem thus acting as a dynamic information hub (Schoptel, 2018).

The linkage between Academic Libraries, Science and Technology Development and Smart Cities

Figure 1provided a conceptual framework of a smart city showing its elements. The main constituent of the smart living/place element is the smart library. Thus, smart libraries whether

academic, public or special libraries directly contribute to the development and sustenance of smart cities. Smarts libraries are repositories of knowledge and they ensure that Public Information Access (PIA) protocols are implemented thus ensuring the transmission of knowledge and information which are two of a three-part transport model of a smart city; the third being "people". Simply put, mobility in a smart city involves the movement of people, information and knowledge.

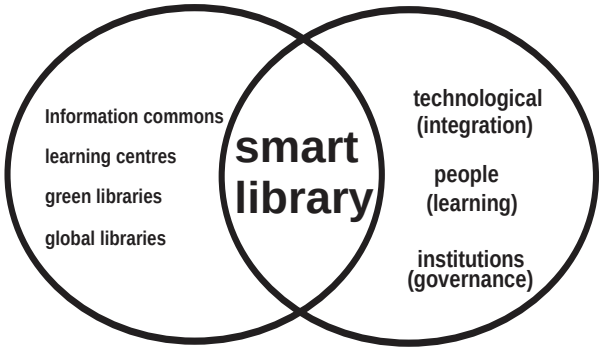

Figure 2: Schopfel's model on the linkage between smart city and libraries (Schopfel, 2018)

Schopfel (2018) proposed a new model on the linkage between smart city and libraries as shown in figure 2. He asserted that there can be no smart city without smart libraries which he described as modern libraries driven not only by new and modern technology but also by the social and human dimensions of a smart city. From this model, the smart library is the element that provides digital information multi-dimensional network for technological development/innovations, smart living and smart governance. However, it is important to note that his model does not capture the channel through which smartlibraries bring about new and modern technologies, that is, science and technology development.

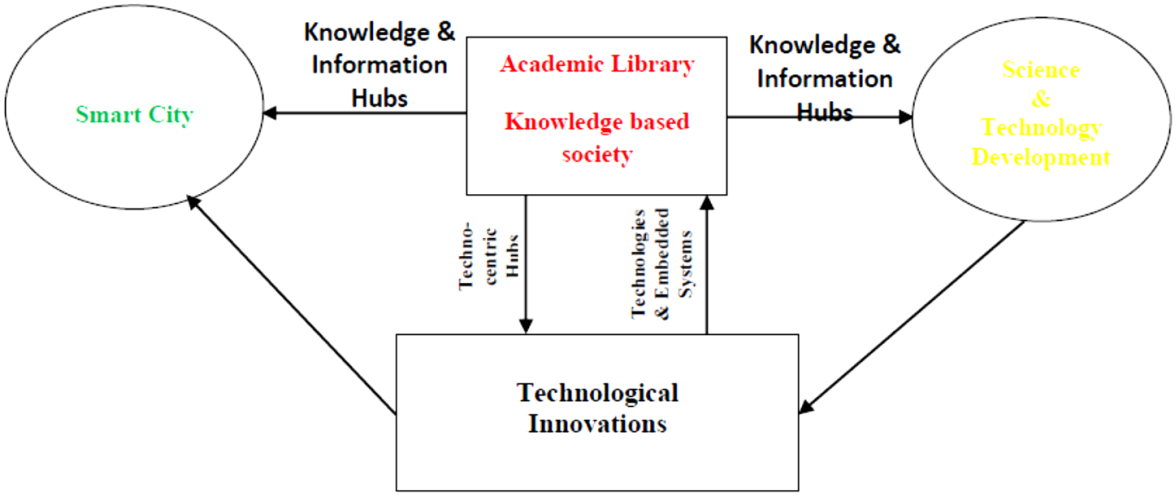

Figure 3: linkage between Academic Libraries, Science & Technology Dev. and Smart City

Figure 3 thus provides a new model showing linkages between academic libraries, science and development and development of smart cities. Academic libraries are conceptualized as a smart place and knowledge-based society that aids in the development of smart people. They aid in creating knowledge hubs and a knowledge-based society pertinent to the needs of the people. Acting as institutionalknowledge repositories, knowledge transmitters, knowledge brokers,authenticators and knowledge hub developers; they directly stimulate the interest in and the development of science and technology whose successes produce technological innovations that transform traditional cities into smart cities and academic libraries into smart libraries. This aligns with the assertions of Abdulsalami, Okezie and Agbo (2013), that knowledge is very vital in attaining scientific, technological, political (governance) and economic development of any nation and that no knowledge-based revolution can happen without efficient information access and academic libraries.

An overview of the Nigerian city smart city initiative and current state of major cities in Nigeria

The world is fast becoming a global village; hence, without the development of smart cities in Nigeria, the country would not interact effectively with the global world. As a response to developing smart cities for Nigerians and better integration into the global advancement initiatives, the Nigerian smart city initiative (NSCI) was launched in Abuja on the 8th of August,

2017 based on the collaborative efforts of the Federal Ministry of communication and the AFRITEX Initiative. The Nigeria smart city initiative was formulated to provide a blueprint or a roadmap based on policies, strategies and legal frameworks to develop or turn major cities in the country into smart cities. According to Mansur (2011), the NSCI plans to rely on the integration of ICT and smart technologies in the administration, development and management of Nigerian cities designed to achieve better connectivity in transport, environment, housing, waste management and urban regeneration.

The NSCI had an audacious goal to transform 50% of Nigerian cities into smart cities; this vision was welcomed with a mixed feeling from technocrats, engineers, ICT professionals, urban planners, surveyors and public servants. However, the following are some of the initiatives:

- **Public service learning management system:** A government e-learning platform for public servants to develop smart public servants for the country.
- **The government integrated financial management system (GIFMIS):** consists of the Treasury Single Account (TSA) and the integrated payroll and Personnel Information System (IPPIS) e-payment system designed to drive the nation towards cashless economy across different sectors of the country for smart living, smart economy as well as smart environment.
- **The Nigerian ICT Roadmap, 2017- 2020:** Formulated as a blueprint aimed at the Nigerian society (holistically) to be ICT compliant and information-driven by the year 2020.
- **National Board for Technology Incubation (NBTI):** This is a government support program providing technical and financial-based support for technological-based startups that fit into the smart city initiative.
- **Nigerian Digital Literacy Council:** This is a government body saddled with the responsibility of improving the digital literacy of average Nigerians transforming them into smart people and smart society requisite for the development of smart cities.
- **National Information Technology Agency (NITDA):** This is a Nigerian government agent with the responsibility for the enforcement of compliance with Public Information Access (PIA) protocol; which requires free internet access in certain public areas across the control.

It is important to note that other initiatives not included are a part of the Nigeria smart city initiative; however, while these may look good on paper, the crux of the matter is their effective implementation. A review of these initiatives shows that the Nigerian government is on track in the implementation of these initiatives towards the realization of smart Nigerian cities. A report from the Nigerian Guardian (April, 2020) indicated that the public service institute of Nigeria (managers of the PLMS) entered into a partnership with a global e-learning institute widely known as edx.org to provide public servants free access to short courses for their development. This is a great step in the right direction in developing smart minds for the Nigerian smart cities. Technology-based startups have been supported by NBTI through programmes such as YOUWIN and YES. An immediate result of these programmes is visible in the use of mobile apps by more business ventures across the country to provide goods and services. However, Nigeria's digital literacy rate has not improved significantly in comparison to the goal of attaining 90% as earlier set. Likewise, most public places, even public-libraries do not provide free access to the internet in line with the Public Information Access (PIA) protocol. These drawbacks have affected Nigeria's drive towards the development of smart cities across the country.

While there has been tremendous improvement towards the development of a smart economy, the present realities indicate that in terms of other elements of a smart city: smart mobility, smart environment, smart governance, smart energy, and smart living, Nigeria's effort has been very minimal. Review done indicated that it is only Lagos State, Nigeria that has significantly made bold steps towards becoming a smart city. Other cities across the six geopolitical zone of Nigeria are still unable to provide public internet access, e-governance platforms, smart trains and city-buses that run on cleaner fuel, smart libraries, knowledge and technology hubs, smart public infrastructure. Yakubu (2018) reported that Lagos state in partnership with Dubai (smart city) had set up over 13,000 CCTV cameras, free wifi connectivity across places in the state and a unified communication system. He also reported that smart mobility such as city buses, city ferries and trains are been used to ease living in the city. Similarly, the implementation of e-governance in Lagos State has increased citizen participation and interest in governance (Yakubu, 2018). The truth is that why Lagos may have achieved much when compared to other states in Nigeria until the challenges of attaining smart energy, smart environment and smart infrastructure are resolved; Nigeria is yet to have a smart city.

The state of the Art of Academic Libraries in Nigeria

According to Yacob (2011), academic libraries are institutions that are established to take care of the information needs of students, lecturers, researchers and other community of scholars.Abubakar (2011) opined that academic libraries in Nigeria are at a crossroads owing to poor financial allocation to the Nigerian universities. He explained that the ten per cent (10%) earmarked from university budget allocation has been diverted due to scarcity of funds. This has affected the general development that the issue of funding is not peculiar to only academic libraries in public universities. Otunla (2016) observed that ICT compliance level of academic libraries is generally below expectation and many are struggling to manage and provide automated services. He explained that most academic libraries are partly up to date and encompassing automated and very few run open access institutionary repositories. However, the recent establishment or digitalization of a few academic libraries in Nigeria by MTN and other corporate bodies has eased the digitalization challenge of most academic libraries in Nigeria which was due to lack of funding. Okeji, Tralagba and Obi (2019) reported the digital literacy of academic librarians was below average, thus, we see why there is a clamour for the digitalization of academic libraries since the academic librarians are not equipped with the skills required to provide digital services to the academic and research community in Nigeria

Similarly, Okeji et al (2019) noted that amidst the several challenges of academic libraries in Nigeria, the issues of erratic power supply and erratic internet connectivity continue to mark the capacity of academic libraries in Nigeria to provide 24- hour digital library services to support academic, research and knowledge-based societies in Nigeria. Thus, the academic libraries in Nigeria require bothinfrastructural and technological upgrade to meet the demands of knowledge-driven societies for the development of science and technology towards the buildings of smart Nigerian cities in the foreseeable future.

Expected roles of Academic Libraries in a Smart City

This paper has established that there can be no smart cities without ‘smart’ academic libraries. Hence, it is important to identify the expected roles/contributions of academic libraries to science and technology development for the building of smart cities in Nigeria.

1. **Knowledge brokers:** A smart city is a city driven by knowledge and technological innovations. Smart academic libraries are knowledge brokers they provide reliable sources of knowledge to solve community problems. Otunla (2016) noted that academic libraries roles in the smart city include providing free e-resources and digital reference services, spaces for children and serving as landmarkarchitecture for the city. Similarly, Jerkov et al. (2015) argued that to develop smart communities, academic librarians encourage the sharing of knowledge among users by linking information seekers with users with such information or knowledge, thereby meeting information needs of users even though the information required was not stored physically or digitally within the library infrastructure.
2. **Access to information and communication technology:**A smart city is a city whose parts are linked via digital networks, making it easy to move or transact from one to another. Also, access to information is a key factor for smartlearning in a smart city. Thus academic libraries are expected to be public places with free wifi in line with the Public Information Access (PIA) protocol already established in cities around the world. This increases access to information and knowledge thus enabling the development of smart people and smart communities which is requisite for achieving a smart economy and smart governance for a smart city. Academic libraries are expected to provide access to technologies such as computers, printers, photocopies in addition to provide internet. These are the hardware that enables the library to serve as a technology hub for the city.
3. **Support services**: Information, digital and research literacy are the hallmarks of smart communities. In other words, information literacy skills, digital literacy skills and research literacy skills are necessary for smart learning in a smart city. Gorichanaz& Turner (2017) described academic libraries as information literacy hubs where the acquisition of information literacy skills are made easy and supported. Goodman(2014) noted that academic libraries are to support digital literacy advancement programs, open access knowledge-basedrepositories, advance e-government and citizen engagement. The facilitation of digital research skills workshop by academic libraries is an important support service as it equips researchers with skills for authentic knowledge delivery.
4. **Creation of knowledge hubs**: As a result of the capacity of academic libraries to provide ICT and broker knowledge, they are enabled to serve as knowledge hubs providing rooms

for learning and getting together. Modular working spaces, facilitating the creation of research and professional groups, creating, facilitating and supporting social networks for expert groups and knowledge enthusiast. They also participate in the creation of new knowledge by leveraging the collective creativity of expert groups via social networks. This creation of knowledge hubs for knowledge-sharing and creation is very important to science and technology development for the building of smart cities as shown in figure 3.

5. **Creation of techno-centric hubs**: the creation of techno-centric hubs is a very important piece in the building of smart cities as illustrated by figure 3. The capacity for academic libraries to broker knowledge, facilitate the creation of new knowledge, provide access to ICT, facilitate information, digital and research literacy as well provide enabling environment for the creation and survival of social networks for knowledge experts and techno-centric hubs, academic libraries serve their communities by helping the jobless find employment, providing linkage between technological innovations and entrepreneurs, supporting makeshift labs for technopreneurs to experiment their innovation as well holding fundraisers for the research and technology communities.

Challenges

The following have been identified as challenges affecting academic libraries in Nigeria

1. **Poor infrastructure:** Inadequate or decay of library infrastructure contributes significantly to poor service delivery (Okoro, Omeluzor, &Bamidele, 2014). Omeluzor, Nwosu&Molokwu (2018) observed dilapidated library infrastructures across academic libraries in South-South and South-Eastern regions of Nigeria. Similarly, Omeluzor, Dolapo, Agbawe and Onasote (2017) also observed issues of dilapidated library infrastructures across academic libraries in the South-western region of Nigeria. Thus, it is obvious that poor library infrastructure is a major challenge faced by academic libraries in Nigeria.
2. **Erratic power supply:** With the need to integrate ICTs into academic libraries for smart services, Nigeria has come to the limelight of academic inquiry. Chukwusa(2015) reported that most academic libraries across Nigeria were using generators as alternative

power supply. He further noted that the use of power generators was not cost-effective and then reduces library finances which would have been used in procuring ICTs for smart services. Chukwusa (2015) suggested that academic libraries should use renewable energy systems such as solar photovoltaic systems as power solutions to the electricity crises facing them.Adeyoyin, Alawiye. AndEwulo (2019) reported that while awareness on solar-based power alternative is high across Nigerian libraries, only a few academic libraries can boast of its usage.

3. **Underfunding:**The underfunding of tertiary education in Nigeria has subsequently affected the statutory 10% university budgetary allocation meant for academic libraries. ThroughIshola (2014)had reported that academic libraries had resorted to various means to increase their internally generated revenue (IGR) for infrastructural and facility upgrade, the revenue obtained is not sufficient to carry out a significant system and infrastructure upgrade as strong and reliable internet connectivity is now a must for academic libraries.
4. **Erratic Internet Connectivity:** Due to libraries NUC accreditation, a policy which now advocates for visits to academic librariesto assert their capacity for providing optimal support to research communities, as well as the need for the digitalization of academic libraries and the requirement of the Public Information Access (PIA) protocols for urban cities. However, Apuke andIyendo (2018), Abubakar and Diyoshak (2014), Baro and Asaba (2010) reported that very many university libraries in Nigeria still do not provide free and adequate internet library services to the university, research and local communities.

Way forward

Recall that earlier in this paper, the infrastructure-people-systems-technology approach to developing smart libraries was proposed. This approach can be adopted for developing smart academic libraries that can contribute towards science and technology development for technological innovations that will drive the building of smart cities in Nigeria. Academic library development in Nigeria would require the building of magnificent library building built and integrated with green library, digital and smart building concepts. The buildings should be iconic to serve as anchor institutions for the communities where they are situated. Secondly, librarians

are key to effective service delivery and maintenance of library physical and digital infrastructure, thus training and retraining of library staff on digital and innovative skills would develop smart libraries to manage the academic libraries. Thirdly, systems are the process that ensures that library services are effectively provided as well as managed. Thus academic library development should ensure that web-based embedded library management system should be integrated into the library and its network to provide smart library services. Lastly, technology gives life to a smart library, thus academic libraries development in Nigeria would focus on the integration of up-to-date ICT, and digital-based technological innovation into the library to provide smart services to all users.

Conclusion

Academic libraries are a vital part of the university and local communities. Their capacity to serve anchor institutions and the bridge to transform traditional cities into smart cities has been established based on the roles they play in advancing science and technology development for building smart societies and cities. This paper concludes that the building of smart cities is not realizable without academic libraries. The roles of academic libraries in buildingsmart cities include the creation of knowledge and techno-centrichubs, knowledge brokerage, access to ICT and research-based support services. The present situation of academic libraries in Nigeria indicates that they are in no shape to fulfil their roles in fostering science and technologyadvancement towards the building of smart cities as they fall below expectation people adequate infrastructures, skilled libraries, digital-based library management systems and up-to-date technological innovation for library and library users. This explains the challengesvarious armsof the Nigerian government continue to face in building smart cities for the 21st-century global economy. Thus, it is too important to state that if nothing is done to upgrade the status of the academic libraries in Nigeria, the Nigerian smart city initiative (NSCI) is but a mere dream.

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